Mr. H. F. Alciatore, May 4, 1907, before the Little Rock, Ark., High School, also May 28, before the Railroad Young Men's Christian Association, Argenta, Ark., on "The work of the Weather Bureau".

Mr. J. Warren Smith, June 20, 1907, before the Franklin County Pioneers' Association, at Westerville, Ohio, on "The making of weather forecasts".

Mr. R. H. Sullivan, June 6, 1907, at the outdoor meeting of the Sedgwick County Horticultural Society, near Wichita, Kans., on "The history, methods, and benefits of the U. S. Weather Bureau".

Mr. A. B. Wollaber, July 1, 1907, before a gathering of the graduates of Pomona College, at Los Angeles, Cal., on "The work of the Weather Bureau and the methods employed in forecasting".

Classes from universities, schools, and colleges have visited the Weather Bureau offices to study the instruments and equipment and receive informal instruction, as reported from the following stations:

Chicago, Ill., January 23, 1907, pupils of the Lake High School; March 23, 1907, pupils of the Central Young Men's Christian Association, of Chicago; March 27, 1907, pupils of the Chicago Normal School; March 30, 1907, pupils of the Lake View High School; April 9 and 11, 1907, pupils of the Thomas Hoyne High School; April 17, 1907, pupils of the South Chicago High School; April 20, 1907, 18 teachers of the Chicago schools; April 29, 1907, pupils of the Hyde Park High School; May 15, 1907, pupils of the Thorp School, South Chicago; June 1, 1907, pupils of the Evanston Township High School, Evanston, Ill.; June 20, 1907, pupils of the J. Sterling Morton High School, Clyde, Ill.

Columbus, Ohio, June 1, 1907, a class in geology from Ohio State University.

Grand Junction, Colo., June 8, 1907, a class from the local School of Journalism.

New Orleans, La., June 6, 1907, a class from the Newman Manual Training School.

San Diego, Cal., June 13, 1907, the physical geography class of the San Diego State Normal School.

Syracuse, N. Y., June 5, 1907, a class from the Syracuse High School.

Vicksburg, Miss., May 29, 1907, part of the junior and senior classes from the Walnut Street High School.

CONFOUNDING CAUSE AND EFFECT.

The following remarks, quoted from the New York Times of June 28, 1907, forcibly repeat the remonstrance which was long since published in the MONTHLY WEATHER REVIEW, but which can not be too often reiterated:

Our first brief "spell" of hot weather ended Wednesday evening, as such "spells" usually do, with a thundershower. Thereupon everybody said, "The storm has cooled the air", just as everybody panting in the heat and humidity had said before the storm came that when it did arrive it would have that highly desirable effect.

And yet there is not, as a matter of fact, the slightest reason for thinking that thunderstorms ever did or ever will "cool the air" or otherwise in any degree change what we call "the weather". These little tempests are an effect of the cool wave, and not at all its cause, for they are produced, in a way fairly well understood, just at the point where a wave of cool air overtakes a hot and humid wave as the two leisurely take their way across the continent; and they are merely a symptom of the final struggle between the two.

It seems as if it would be easy to keep this sequence of events in mind, once it had been learned, and this one has been explained often enough; but habits of speech, inherited from innumerable prescientific days, are hard to break, and for centuries to come, probably, people and newspapers will continue to credit thunderstorms with bringing a relief as little the work of the storms as it is the work of the newsboys who sell the papers announcing the amount of rain that fell. Even the professional weather observers continue to use the old, wrong phrases; at any rate, the reporters quote them as using those phrases, and we have yet to hear of any protests from the Bureau men.

THE ST. SWITHIN'S DAY FALLACY.

By J. H. MORRISON. Dated Brooklyn, N. Y., June 14, 1907.

The legend of St. Swithin relates that he died in 862, and was buried on the north side of the church at Winchester, England. Many years later, on July 15, when his body was to have been disinterred and buried again inside the walls of the church, excessive rains occurred, continuing for 40 days, whence the saying that if rain falls on July 15 it will continue to fall every day, more or less, for 40 days following. The idea of this 40 days' rain in England was brought to America in colonial days, and is still current in many parts of the country.

Meteorologists have examined the rainfall statistics of Great Britain and have shown that there are no forty successive days of rain after July 15, and, in fact, no apparent connection between the weather of that date and the 40 days following[1]; but I know of no special study of the subject based on records for this country.

The early meteorological records of the United States are somewhat incomplete, but from a record kept of observations made by Prof. Parker Cleaveland of Bowdoin College at Brunswick, Maine, and published by the Smithsonian Institution, we are able to obtain the number of days of rain at that station for the full months of July and of August from 1808 to 1859. For this period of 51 years the average number of days of rain during the whole month of July was 7.1 days, and for the month of August 6.7 days. The highest number of days in July when there was rain was 13 in 1808, and the same number in 1828, and in August there were 13 days in 1812 and the same number in 1826. The greatest precipitation at this station was in August, 1843, when there fell 12.21 inches, and the next was in July, 1845—8.67 inches. The average rainfall for 31 years for July was 3.65 inches and for August 4 37 inches.

The record of observations made by Dr. S. P. Hildreth at Marietta, Ohio, from 1818 to 1859, as published by the Smithsonian Institution, is not full, but it shows that for a period of 32 years the greatest number of days of rain for July was 18 days in 1831, and 16 days in 1848. The month of August does not show such a wide range of days of rain, there being 4 years of 11 days each, 4 years of 10 days each, and 5 years of 9 days each. The average number of days of *no rain* during this period, by this record, was for July 21.9 days, and for August 21.7 days. The annual average of days of rain for the 32 years was for July 8.3 days, and for August 7.6 days. The greatest monthly precipitation during the two months was in July, 1831, 12.12 inches.

The data from the two preceding stations being from *monthly* records of the observations are not so valuable as desired for the purpose of this paper, still they show that there was not one year when 40 days of rain took place at the stations during the period.

The most valuable study for this country that can be made of the weather during the 40 days succeeding St. Swithin's Day is that from the tables of the daily precipitation prepared especially by the writer for this paper from the official records of the United States Weather Bureau in New York, and those of the meteorological observatory in Central Park, New York. This is the first time that this period of weather has been so covered. There are some advantages to be obtained from the comparisons of these records, tho they are not for the same period of time; for the meteorological observatory table covers 36 years, while that of the United States Weather Bureau is for 35 years. These stations being comparatively so short a distance apart, 4.8 miles in a nearly north and south direction, and in the charge of trained observers of

[1] See Prof. W. W. Bryant: The St. Swithin's Day Tradition. The Observatory, November, 1904. Symons's Meteorological Magazine, October, 1904, vol. 39, page 175.

the weather, these tables have much value in a paper on this subject, so far as our climate is concerned.

An analysis of these tables shows the following results:

Rainfall on St. Swithin's Day and during the 40 days following at United States Weather Bureau station, New York, N. Y.

Year.	Precipitation on July 15.	Days with rain.	Days with no rain.	Days with trace of rain.	Rainfall in 40 days.
	Inches.				*Inches.*
1872	2.33	16	24		11.87
1873	.00	23	17		10.24
1874	.00	12	28		3.47
1875	.00	23	17		14.91
1876	.00	14	24	2	6.71
1877	.00	15	24	1	4.30
1878	.00	15	24	1	9.37
1879	.00	14	25	1	6.45
1880	.36	13	26	1	5.59
1881	.00	8	28	4	1.97
1882	.00	7	30	3	1.03
1883	.40	13	25	2	3.63
1884	.00	16	22	2	7.47
1885	.00	10	27	3	6.38
1886	.02	15	22	3	2.57
1887	.00	19	19	2	8.67
1888	.00	14	23	3	6.95
1889	.89	18	20	2	10.96
1890	T.	15	17	8	6.14
1891	.07	20	15	5	4.92
1892	.00	12	25	3	2.49
1893	.00	13	25	2	3.99
1894	.25	14	24	2	2.22
1895	.00	14	21	5	5.39
1896	.00	19	20	1	5.17
1897	.06	24	11	5	7.61
1898	.00	16	15	9	4.84
1899	.00	15	17	8	5.86
1900	.03	14	21	5	4.17
1901	.00	16	18	6	5.67
1902	.27	19	16	5	5.96
1903	.00	17	19	4	5.74
1904	.00	17	18	5	8.87
1905	.01	16	21	3	6.11
1906	.01	16	22	2	5.07
Total	4.70	542	750	108	212.76

Average number of days of rain in the period of 40 days during 35 years, 15.48 days.

Average number of days of rain in the period of 40 days during 35 years, with days of traces of rain included, 18.54 days.

Average number of days of no rain, 21.42 days.

Average rainfall for 40 days, 6.08 inches.

The four years of greatest precipitation during these 40 days were 1872, 1873, 1875, and 1889. In both 1872 and 1889 the 15th of July was a wet day, having a rainfall record of 2.33 inches for the first and 0.89 inches for the latter year, while 1873 and 1875 had dry days on July 15. The proportion of dry and wet days for July 15 in 35 years is 22 dry days to 13 wet days. In 1873 there were 8 wet days in July and 15 wet days in August, and in 1875 there were 8 wet days in July having a precipitation of 4.49 inches, and 15 wet days in August with a rainfall of 10.42 inches. This was the year, during the period of 35 years, when the greatest rainfall took place in the 40 days, and next to the highest number of days of rain, exclusive of the days when "traces" were recorded. In 1889 there were 8 wet days in July and 10 in August having a total precipitation of 10.96 inches. The days of greatest precipitation were July 26, 1872, when there was a rainfall of 3.80 inches; August 12, 1875, with a rainfall of 3.34 inches; and July 27, 1889, with 2.77 inches. There were in the 35 years, during this special 40-day period, 3 days in July and 8 days in August when the daily precipitation ranged between 2.06 and 2.45 inches.

Average number of days of rain in the 40 days during 36 years, 14.03 days.

Average number of days of no rain in the 40 days during 36 years, 25.97 days.

Average rainfall for 40 days, 6.34 inches.

There were on July 15 11 wet days and 25 dry days during the 36 years.

The record of the Central Park Observatory shows:

Rainfall on St. Swithin's Day and during the 40 days following at Meteorological Observatory, Central Park, New York, N. Y.

Year.	Precipitation on July 15.	Days of rain.	Days of no rain.	Rainfall in 40 days.
	Inches.			*Inches.*
1871	.02	17	23	6.55
1872	1.57	18	22	10.11
1873	.02	19	21	11.01
1874	.00	8	32	3.29
1875	.00	19	21	12.86
1876	.00	10	30	4.90
1877	.00	13	27	6.22
1878	.00	15	25	9.59
1879	.00	12	28	9.13
1880	.34	11	29	6.92
1881	.00	8	32	1.09
1882	.00	5	35	.60
1883	.69	10	30	2.90
1884	.00	15	25	6.56
1885	.00	11	29	5.73
1886	.01	16	24	2.77
1887	.00	17	23	7.55
1888	.00	14	26	8.67
1889	.89	19	21	13.95
1890	.00	17	23	6.96
1891	.05	16	24	5.37
1892	.00	13	27	4.08
1893	.00	10	30	5.48
1894	.04	13	27	1.94
1895	.00	15	25	5.88
1896	.00	15	25	6.32
1897	.00	20	20	6.75
1898	.00	16	24	4.46
1899	.00	15	25	5.19
1900	.06	11	29	4.96
1901	.00	14	26	6.08
1902	.31	17	23	9.48
1903	.00	13	27	6.52
1904	.00	18	22	9.92
1905	.00	13	27	5.02
1906	.00	12	28	3.39
	4.00	505	935	228.10

On July 15, 1872, there was a rainfall of 1.57 inches, and during that period of 40 days there was a precipitation of 10.11 inches; while the next year on July 15 there was a rainfall of .02 inch, and a total for the following 40 days of 11.01 inches; and in 1889 there was a rainfall on the first day of the period of .89 inch, and a rainfall for the 40 days of 13.95 inches. These periods show the greatest number of wet days, with two exceptions, during the 36 years.

Then we find there was a dry July 15 in 1875, when there was a rainfall for the 40 days of 12.86 inches; then for 10 years following there were 8 years each having a dry opening day, when the precipitation for the 40 days ranged from 0.6 inch to over 9 inches. There were two dry periods in succession, both having dry opening days, that of 1881 with but 8 wet days, and 1882 with but 5 wet days out of the 40. These periods had the least precipitation of any of the years under review. Then for the next 24 years there was but one period when there was a rainfall of over 10 inches, and only two others of 9 inches each, in the 40-day period. For the 17 years following the year of the period of greatest rainfall, 13.95 inches, there has been a much lower average of rainfall during the period than that for the previous 19 years.

To show that the same percentage of rainy and rainless days, on an average, would occur for an extended period of time, viz, 40 days, at another season of the year than the St. Swithin period, an examination of the record to the present year for 38 years, from February 21 to March 31,—these two months showing the highest average of precipitation for an extended period of years, next to July and August—was made and indicated that out of 1491 days there were 557 days on which there was rain, and 934 days on which there was no rain, giving an average for the period from February 21 to March 31, inclusive, of each year, of 14.66 days on which there was rain, and 24.58 days of no rain. It is thus apparent that the same general average of dry and wet days holds good during another season of the year in this climate at least.

An analysis of the prominent records on the subject shows that the average number of days of rain in the 40-day period of St. Swithin is for Greenwich 18.85 days, for Dumfries 22.2

days, for U. S. Weather Bureau at New York 15.48 days, and for Meteorological Observatory at New York 14.03 days. It will be seen by these figures that there is a greater number of days of rainfall at the two stations in the British Isles than there has been at New York, and a much wider range of the number of days, whereas the records in the city of New York show that there is a less number of days, and the number of days is very limited in its range. These figures should efface from the card of probabilities this superstition of St. Swithin's Day so far as the climate of the United States is concerned. Altho the records of the climate of Great Britain show a larger number of days of rainfall there than in the city of New York, yet the old legend should receive the same favor there as in this country. It seems to be almost useless to say anything further regarding the absurdity of this old superstition, with such an array of telltale figures all set against the legend.

It has been suggested that the greater precipitation at our southern coast cities would show a much higher average than at New York, if it did not show that the old legend would at times hold good; but an examination of the records of two of the southern weather stations shows that the higher average during the period is of no moment, and that there has never been a year when there were 40 successive days of rain after July 15.

THE "SANTA ANA" OF CALIFORNIA.

The dust storms of the San Gabriel Valley are described by Prof. George E. Hale in the following quotation from his report in the Annual Volume for 1906, of the Carnegie Institution of Washington:

I have previously alluded to the dust storms which sometimes enter the San Gabriel Valley thru the Cajon Pass from the Mojave Desert, and those much rarer storms in which the dust is carried by the wind completely over the Sierra Madre Mountains. In the more common form of dust storm (the so-called "Santa Ana") the dust enters the valley in a fairly well-defined mass and proceeds westward along the canyon of the Santa Ana River. In approaching the coast it spreads over a large area and diffuses itself with tolerable uniformity thru the lower atmosphere. I have seen from Mount Wilson a dust storm in the region of Riverside which in twenty-four hours had spread itself over Los Angeles and Pasadena. When it reached this part of the valley there was almost no wind, and the dust seemed to diffuse itself thru the air. Such storms sometimes completely hide the Sierra Madre Mountains from observers in Pasadena. Fortunately they are almost always confined to the lower atmosphere, and do not appreciably affect the transparency of the sky above Mount Wilson, where daily observations show that the transparency of the day and night sky are very satisfactory.

STANDARD TIME.

According to the Monthly Notices, Royal Astronomical Society, February, 1907, the standard time used in India since July 1, 1905, has been five hours and thirty minutes fast on Greenwich time; that of Burma is six and a half hours fast, but the time ball of the Colaba Observatory, Bombay, which is about 73° east of Greenwich, drops daily at exactly 3 a. m., Greenwich time, or about 8 a. m., local time. The Council at Port Louis, Mauritius, has decreed that from and after January 1, 1907, the standard time for that colony and its dependencies shall be that of the meridian 60° east of Greenwich. (The longitude of Mauritius is about 58°.) The standard for the Seychelles is also four hours fast on Greenwich time; but the standard for the Chagos Archipelago is five hours east of Greenwich. These regular hour standards are convenient for local use in many respects; but when it comes to interchange of meteorological data by cable and wireless, as well as by the ordinary telegraph and telephone, it would seem that the time must soon come when the world will find it best to adopt the Greenwich time uniformly. We do not, ourselves, appreciate the necessity for having, in India and the ocean south of it, four different standards (four, five, five and a half, and six and a half hours from Greenwich). The inconvenience of an irregular and arbitrary system of standards is appreciable, tho of course not to be compared with the confusion that existed before any standard was adopted. We fear that the subdivision into half and quarter hours will do more harm than good.—EDITOR.

PENALTY FOR COUNTERFEITING FORECASTS.

The Agricultural appropriation bill for the fiscal year ending June 30, 1906 [Statutes at Large, vol 33, part 1], contained the following legislative item:

Any person who shall knowingly issue or publish any counterfeit weather forecasts or warnings of weather conditions, falsely representing such forecasts or warnings to have been issued or published by the Weather Bureau, or other branch of the Government service, or shall molest or interfere with any weather or storm flag or weather map or bulletin displayed or issued by the United States Weather Bureau, shall be deemed guilty of a misdemeanor, and, on conviction thereof, for each offense, be fined in a sum not exceeding five hundred dollars, or be imprisoned not to exceed ninety days, or be both fined and imprisoned, in the discretion of the court.—(See Act of Congress approved March 3, 1905.)

EQUINOCTIAL STORMS.

By Prof. E. B. GARRIOTT.

The term "equinoctial storms" has for centuries been applied to storms that happen near the spring and autumn equinoctial periods. Like many other popular impressions regarding imperfectly understood natural phenomena the general idea had its origin in observed facts. The difficulty in this case has been that the facts concerning the character and seasonal and geographical limits of storms that are associated with the equinoxes have given way to fancy. The rainy season of the Tropics, and the storms of the middle latitudes that occur in the spring and fall, have been confused with the severer storms known as hurricanes, cyclones, and typhoons that are experienced in the tropical and subtropical regions and even in the middle latitudes in certain seasons of the year.

The rainy season of the Tropics, which is entirely distinct from the season of equinoctial storms, attends the annual march of the sun over the equatorial regions. When the sun in its northward journey crosses the imaginary line of the equator the rainy season sets in over the northern equatorial region, and the rain belt keeps pace with the northward movement of the sun until the time of the summer solstice, about June 21, when the sun reaches the point farthest north in its course. About that time the rain belt reaches into the northern subtropical regions, like Florida, and the rainy season begins in those regions. In tropical countries, like the Isthmus of Panama, there is usually a short, dry season in the interval following the northward movement of the rain belt and its return southward with the sun. The characteristics of the rains of the Tropics are controlled largely by geographical and topographical features. They come in the form of local thunderstorms that are often attended by torrential rains and sometimes by severe wind squalls. Their occurrence is usually confined to the afternoon and the early portion of the night.

The season of severe tropical, or equinoctial, storms in the Northern Hemisphere, and more especially in the tropical and subtropical North Atlantic Ocean, does not begin until the sun has about half completed its return course to the equator. They occur near the time of the autumnal equinox, and their season extends from August to October, inclusive. In the North Atlantic Ocean these storms are called hurricanes, in the Indian Ocean, cyclones, and in southeastern Asiatic waters, typhoons. In the Pacific area the typhoon season begins earlier and continues later than the hurricane season of the North Atlantic Ocean.

At first sight it appears that astronomical events that forerun by several weeks meteorological phenomena can not be associated with those phenomena in the relation of cause and effect. Meteorological changes and conditions, due to astronomical causes, do not necessarily coincide in time of occur-